

ORIGINAL RESEARCH

Metabolic syndrome in rural Australia: An opportunity for primary health care

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Abstract

Objective: To measure the impact of a 6-month home-based behaviour change intervention on reducing the risk of chronic disease as determined by metabolic syndrome status and cardiovascular risk score, and discuss implications for primary care in rural areas.

Design: A two-arm randomised controlled trial of rural adults.

Setting: The rural town of Albany in the Great Southern region of Western Australia.

Participants: Participants (n = 401) aged 50–69 years who were classified *with* or *at risk* of metabolic syndrome and randomly assigned to intervention (n = 201) or waitlisted control (n = 200) group.

Interventions: A 6-month intervention program incorporating goal setting, self-monitoring and feedback, with motivational interviewing was conducted.

Main outcome measures: Change in metabolic syndrome status and cardiovascular risk.

Results: Significant improvements in metabolic syndrome status and cardiovascular disease risk score (−0.82) were observed for the intervention group relative to control group from baseline to post-test.

Conclusion: This home-based physical activity and nutrition intervention reduced participants' risk of experiencing a cardiovascular event in the next 5 years by 1%. Incorporating such prevention orientated approaches in primary care might assist in reducing the burden of long-term chronic diseases. However, for realistic application in this setting, hurdles such as current national health billing system and availability of resources will need to be considered.

KEYWORDS

cardiovascular diseases, health promotion, obesity, preventive health, rural health

1 | INTRODUCTION

Metabolic syndrome (MetS) is a constellation of factors that are common to, and increase the risk of, type 2 diabetes mellitus (T2DM) and cardiovascular disease (CVD).^{1,2} These factors include hypertension,

dyslipidaemia, inflammation and glucose intolerance.¹ Excess body weight, physical inactivity, sedentary behaviour, poor diet and advancing age^{3,4} all increase an individual's pre-disposition to developing the identified factors associated with MetS. The risk of T2DM is 3.5–5 times more likely among adults with MetS,⁴ which also increases

the risk of CVD,⁵ with the risk of myocardial infarction increasing threefold to fourfold.¹

Adults living in rural areas are more likely to be overweight or obese, insufficiently active and have higher blood cholesterol compared to their metropolitan counterparts,⁶ which increase their risk of MetS and CVD and in turn their prevalence.⁷ Often in rural Australia, older adults have limited access to medical specialist and lifestyle services compared to their metropolitan counterparts.⁶ However, rural primary care is a service that regularly sees patients who might be at high risk of developing a chronic disease,^{8,9} this places GPs in a unique position to put preventative care high on the agenda.¹⁰ This proactive approach by GPs is one that at-risk patients encourage and are receptive to.¹¹

Metabolic syndrome status and CVD risk score are relatively easy to determine in general practice. The International Diabetes Federation (IDF) criteria are based on five criteria that support identification of risk of developing T2DM,¹² while the National Vascular Disease Prevention Alliance's (NVDPA) Australian Absolute CVD Risk Calculator¹³ determines the likelihood of an individual having a CVD event by the next 5 years. Through these methods, early detection and treatment can be initiated by way of lifestyle interventions such as physical activity and nutrition interventions or if required, pharmaceutical treatment.¹⁴ However, management of T2DM and CVD is difficult once these diseases develop, emphasising the need for prevention, as well as early warning or screening systems that support early intervention strategies¹⁵ for those at risk of T2DM and CVD,¹⁶ especially in rural areas of Australia.

A major challenge for the Australian health system relates to the ageing population and the long-term impact of chronic diseases.⁶ Improvement in health outcomes through effective prevention, early detection and appropriate management strategies are priorities for the prevention of chronic diseases.⁶ The Albany Physical Activity and Nutrition (APAN) study specifically targeted rural adults with or at risk of MetS, who were therefore at increased risk of chronic diseases.¹⁷ Albany was selected as a study site because of its ageing population (32% aged 50 and over)¹⁸ and low Socio-Economic Indexes for Areas (SEIFA) score (989).¹⁹ A SEIFA score of <1000 is considered low and known to correlate with a lower health status.²⁰ This paper describes the effect of a home-based randomised controlled trial, to determine the impact of changes in physical activity and diet on MetS status and CVD risk score, and discusses the implications for primary care in rural areas of Australia.

What is already known on this subject:

- Metabolic syndrome, obesity and related chronic diseases can be improved via physical activity and dietary behaviour change.
- In rural Australia, there is a high prevalence of metabolic syndrome and overweight- or obesity-related chronic disease.
- General practitioners have access to high-risk chronic disease individuals and regularly treat metabolic syndrome with drug therapy.
- The reorientation of health services should be incorporated into health promotion action as part of a comprehensive approach to the prevention of chronic disease.

What this study adds:

- Participants in a 6-month physical activity and nutrition home-based program lowered their metabolic syndrome risk and cardiovascular disease risk score.
- Early identification and intervention for high-risk groups can significantly lower the risk of chronic diseases.
- Opportunities lie within primary care services to contribute to the prevention of chronic diseases in rural areas of Australia.

2 | METHODS

2.1 | Study design

The APAN study was a two-arm RCT of a behaviour change intervention conducted during 2014-2015.

2.2 | Sample

Rural adults (n = 401) were recruited from Albany, Western Australia and participants were required to be aged 50-69 years and classified as *with* or *at risk* of MetS, based on IDF criteria.³ Participants *with* MetS had central obesity (waist circumference ≥ 94 cm for men or ≥ 80 cm for women [Europids, Sub-Saharan Africans, Eastern Mediterranean, Middle Eastern]; ≥ 90 cm for men or ≥ 80 cm for women [South Asians, Chinese, Japanese]) plus any two of the following parameters: raised triglyceride level (≥ 1.7 mmol/L, or treatment for this); reduced high-density lipoprotein (HDL) cholesterol (< 1.03 mmol/L for men and < 1.29 mmol/L for women, or treatment for this); raised

blood pressure (systolic ≥ 130 mm Hg or diastolic ≥ 85 mm Hg, or treatment of previously diagnosed hypertension); raised fasting plasma glucose (≥ 5.6 mmol/L). Participants were classified as being *at risk* of MetS if they had one of the above parameters, in addition to central obesity.

2.3 | Intervention

Participants provided informed consent and were randomly assigned to intervention ($n = 201$) or wait-listed control ($n = 200$). The intervention group received a 6-month program based on the Australian Dietary²¹ and Physical Activity and Sedentary Behaviour Guidelines,²² which incorporated goal setting, self-monitoring and feedback guided by Self-Determination Theory constructs.²³ Motivational interviewing²⁴ was conducted by the trained researchers via telephone. The attrition rate for the intervention was 18% and the main reasons for withdrawal were due to health issues, personal reasons and loss of interest.²⁵ The protocol for recruitment, process and intervention outcomes has been described elsewhere.^{8,17,26}

2.4 | Measures and statistical analysis

Outcome measures for this study are changes in MetS status and CVD risk score from baseline to post-test. CVD risk score was calculated using the NVDPA's Australian Absolute CVD Risk Calculator.¹³ Descriptive statistics summarised the demographic characteristics, MetS status and CVD risk score at baseline. CVD risk score was analysed using independent and paired t tests for continuous outcome variables, and Mann-Whitney U tests and Wilcoxon Signed Rank tests for non-normally distributed variables. Chi-square tests were used to analyse the change in MetS status both between- and within-groups over time.

2.5 | Ethics approval

The study was approved by the Curtin University Human Research Ethics Committee (approval number HR149_2013) and the trial was registered with the Australian and New Zealand Clinical Trials Registry (ACTRN12614000512628).

3 | RESULTS

A total of 401 participants undertook baseline measures and 310 (77.3%) completed the post-test. The majority of participants was women (66.5%) with a mean age of 61 years (SD = 5.41) and mean BMI of 30.8 kg/m². Participants were excluded from analysis due to missing blood samples or changes to medication ($n = 38$), leaving 130

intervention (64.7%) and 144 controls (72.0%) available for analysis of MetS status. Six intervention and nine control group participants were excluded from the CVD risk score analysis since their systolic blood pressure was >180 mm Hg or total cholesterol >7.5 mmol/L and their score was

TABLE 1 Baseline characteristics of participants, Albany, Western Australia, 2014-2015

Variable	Intervention group (n = 151)	Control group (n = 159)	P value ^a
Age (y): Mean (SD)	60.5 (5.64)	61.3 (5.18)	0.18
Gender: female	100 (66.2%)	106 (66.7%)	0.93
Employment status			
Full time	78 (51.7%)	65 (40.9%)	0.30
Part time	24 (15.9%)	29 (18.2%)	
Unemployed	5 (3.3%)	7 (4.4%)	
Retired	44 (29.1%)	58 (36.5%)	
Education			
Primary school	3 (2.0%)	2 (1.3%)	0.42
Secondary school	55 (36.4%)	72 (45.0%)	
TAFE/ Diploma	52 (34.4%)	46 (28.8%)	
University	41 (27.2%)	39 (24.5%)	
Relationship status			
With partner	124 (82.1%)	129 (81.1%)	0.81
Smoking status			
Never	84 (55.6%)	84 (52.8%)	0.85
Ex-smoker	52 (34.4%)	54 (33.8%)	
Occasional smoker	3 (2.0%)	4 (2.5%)	
Daily smoker	12 (7.9%)	17 (10.6%)	
Co-morbidity ^b			
Yes	92 (60.9%)	104 (65.4%)	0.41
Alcohol drinking			
Yes	99 (65.6%)	113 (71.1%)	0.96
	(n =130)	(n =144)	
Metabolic syndrome status			
With	66 (50.8%)	77 (46.5%)	0.66
At risk	64 (49.2%)	67 (46.5%)	
	(n =124)	(n =135)	
CVD risk score: Mean (SD)	7.03 (4.1)	6.90 (4.0)	0.96

^a t test or chi-square test between intervention and control groups.

^bPresence of at least one of eight common health problems.

TABLE 2 Between- and within-group changes in MetS status and CVD risk score

Outcome	Intervention group (n = 130)		<i>P</i> ^a	Control group (n = 144)		<i>P</i> ^a	<i>P</i> ^b	<i>P</i> ^c
	Baseline	Post-test		Baseline	Post-test			
With MetS	66 (50.8%)	51 (39.2%)	0.03	77 (53.5%)	78 (54.2%)	0.69	0.72	0.02
At risk of MetS	64 (49.2%)	56 (43.1%)		67 (46.5%)	46 (31.9%)			
	(n = 124)			(n = 135)				
CVD risk score ^d : all participants	7.03 (4.1)	6.21 (3.9)	<0.001	6.90 (4.0)	6.66 (3.8)	0.30	0.96	0.02
CVD risk score ^d : with MetS	8.54 (4.2)	7.44 (4.1)	<0.001	7.90 (4.05)	7.30 (3.9)	0.04	0.33	0.72
CVD risk score ^d : at risk of MetS	5.48 (3.5)	4.93 (3.2)	0.01	5.78 (3.6)	5.95 (3.7)	0.51	0.46	0.08

^aChi-square or paired *t* test between baseline and post-test.

^bChi-square or independent *t* test between intervention and control groups at baseline.

^cChi-square or independent *t* test between intervention and control groups at post-test.

^dMean (SD).

unable to be calculated as per NVDPA guidelines.¹³ There were no significant between-group differences in demographic characteristics,¹⁷ MetS status ($P = 0.66$) and CVD risk score ($P = 0.96$) (Table 1).

Between- and within-group changes in MetS status and CVD risk scores are presented in Table 2. Significant improvements in MetS status were observed for the intervention group ($P = 0.03$), with 15 (23%) fewer participants classified with MetS and 8 (12%) less classified at risk of MetS at post-test. No significant changes in MetS status were seen in the control group. Overall, the intervention group demonstrated a significant decrease in CVD risk score (-0.82 , $P < 0.001$) from baseline to post-test. There was also a significant difference between groups at post-test for MetS status ($P = 0.02$) and CVD risk score ($P = 0.02$).

4 | DISCUSSION

This study demonstrated the positive impact of a 6-month physical activity and nutrition home-based intervention on MetS status and risk of future CVD events in a rural older population. At the end of the intervention, the MetS and CVD risk score was lower for the intervention group, as a result of significant improvements in dietary and physical activity behaviours (fat and fibre intake; moderate intensity physical activity).⁸ Improvements in MetS and CVD parameters (triglyceride, total cholesterol and non-HDL cholesterol concentrations; waist circumference, waist-to-hip ratio, weight and body mass index) were reported elsewhere.¹⁷

Strategies to increase physical activity levels, maintaining a healthy diet and healthy weight maintenance are central to the prevention of CVD, T2DM and other chronic diseases.²⁷

Intervention program participants' improvements strongly support the effectiveness of a home-based lifestyle approach towards management of chronic disease in a high-risk rural population.^{28,29} However, how best to implement such a program on a broader scale is the challenge.

Interestingly, 90% of women and 80% of men visit a GP in a 12-month period⁶ and it is estimated that 60%-70% of primary health care visits are for non-communicable diseases (NCDs).³⁰ Considering this, primary care might be well-placed to identify those individuals at risk via early screening, and management of such factors as high blood pressure, elevated blood glucose and abnormal lipid profiles. However, the incorporation of prevention into primary care is challenging for a number of reasons. These include the health systems billing process, processes that evolved in an era of infectious disease and acute consultations.³¹ Review of this billing system would be needed before prevention services could be properly implemented. In addition, those working in primary care are often time poor,³² there can be issues with retention, and language and culture barriers for patients being serviced by overseas trained health professionals.^{33,34} Also, the distances travelled by some rural residents for medical consultations can result in sporadic acute visits³⁵ and health outcomes might be impacted by varying levels of health literacy.³¹

It seems currently primary care does not have the capacity or support mechanisms to comprehensively address prevention of NCDs.³⁶ This leads at times to a focus on drug therapy and less emphasis on the provision of healthy lifestyle and management.^{37,38} This approach might also be due to drug therapy being seen as more efficacious³⁹ rather than the longer term and more challenging strategies of increasing physical activity levels, improving dietary intake and losing excess weight as a means to improve glycaemic control and lipid profiles.⁴⁰ Those working in primary care

and their patients may have a high affinity and trust towards therapeutic methods, as opposed to lifestyle prevention methods.^{39,41} This disease-treatment response would benefit from consideration of lifestyle-counselling that supports a proactive dialect, empowerment and behaviour change.^{30,42,43}

5 | LIMITATIONS

This was a small study based in a rural community that provides some insight into the impact of a home-based program on metabolic status and CVD risk. Although the lowering of the CVD risk score was marginal, any reduction in the CVD risk is advantageous as it reduces the probability of developing a cardiovascular event in the next 5 years.¹³ The study collected the objective data; however, the intervention period was limited (6 months). Determining the impact of the intervention over a longer period would be advantageous.

In summary, this home-based physical activity and nutrition intervention reduced participants' risk of experiencing a cardiovascular event in the next 5 years by 1% and although this reduction was marginal, surely any reduction is advantageous in an ageing population. Primary care is a setting that provides regular access to high-risk individuals, incorporating prevention orientated approaches in primary care might assist in reducing the burden of long-term chronic diseases. For realistic application in this setting, hurdles such as current national health billing system and availability of resources will need to be reviewed. However, we believe the findings emphasise the value of primary prevention and contribute to the evidence to support future policy that calls for increased focus on prevention in primary care.

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DISCLOSURE STATEMENT

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AUTHORS' CONTRIBUTIONS

KB coordinated the APAN program. KB, JJ and CB drafted the manuscript. KB, JJ, AL, AJ, PH, APH and AA designed the study, and revised the manuscript. All authors read and approved the final manuscript.

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